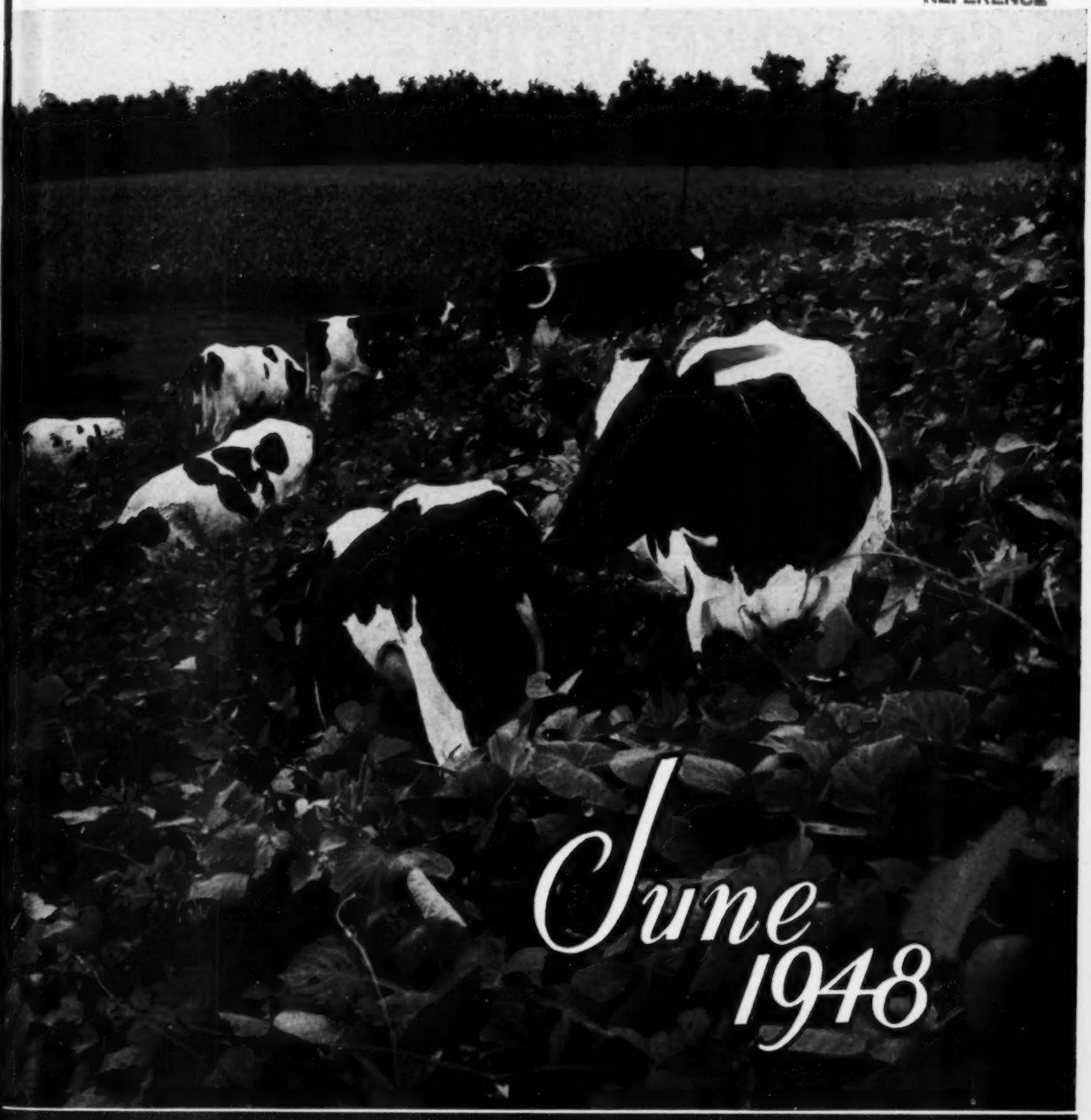

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SOIL CONSERVATION

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SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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In this Issue—

WELLINGTON BRINK
Editor
Art Work by
W. HOWARD MARTIN

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with approval of the Director of the Budget. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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WE GO TO PINE-TREE STATE.—Two districts in Maine are now sending Soil Conservation Magazine to all high school libraries and all vocational agriculture teachers within their bounds. To effect such coverage 20 subscriptions have been underwritten by the Kennebec County Soil Conservation District; Wesley Norton, chairman. Twenty-three subscriptions have been paid for by the Knox-Lincoln Soil Conservation District; Ray Thurston, chairman.

WOODLAND PROFITS.—Jake Woofter, who lives near Weston in Lewis County, W. Va., harvested $10,000 worth of timber during 1946 from his 40-acre woodlot. He insisted in his contract that loggers could take only trees above 22 inches in diameter. He also made loggers take special care not to damage the remaining trees.

"Don't let anybody tell you a farm woodlot can't pay its way," said Mr. Woofter. "It just takes a little care and planning."

THE COVER.—This kudzu planted in gullies on farm near Rocky Mount, Va., quickly spread over two acres of steep, rough land. Owner's Holsteins thrive. Photograph by Orin S. Welch.

FRONTIER RANCHING *where the Skagit Flows*

The 1948 model P & O Ranch will be a showplace for conservation ranching practices. Austin B. Summers, left, work unit conservationist, explains details. The cleared land seen here will be seeded to range grasses.

By Herb Boddy

CUTTING THE PATTERN of a modern cattle ranch today is still pretty much a frontier undertaking to Harold Pierson and James Ovenell, coowners and operators of the new P. & O. Hereford ranch, near Concrete in northwest Washington.

The two Mt. Vernon farmers are blasting and bulldozing around 455 acres of tall timber in the scenic, sportsmen's playground area of the Upper Skagit River country. Their land-clearing operations are preliminary to setting the stage for opening one of the biggest cattle ranches in Skagit County.

Townsfolk of Concrete, who would rather have a tenderloin at fork's end than a dozen juicy steaks in status quo, will have to get used to sniffing hundreds of tender cuts "on the hoof" within rifle shot of city hall.

Ranchers Pierson and Ovenell are building their cattle enterprise on firm basis of soil conservation. They are taking no chances gambling with hit-or-miss ranching short-cuts. You don't run a 400-head, 732-acre ranch "by guess and by golly," they say.

Backdrop for the P. & O. rancho is the rustic, unchanging Skagit River vacationland. The meandering Skagit River and its steelheads pass the northern fringe of the range. Almost within shadow distance is high and mighty Mt. Baker. Close by, to the east, is Mt. Sauk. Add the surrounding evergreen forests and you have a ringside picture of the setting for the Pierson and Ovenell operations.

When the cattlemen picked their ranch site in 1942, sage Skagit River backwoodsmen summed

NOTE.—The author is of the current information staff, Soil Conservation Service, Portland, Oreg.

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Pattern for the ranch was cut from the scenic, tall-timbered Skagit River playground area, one of Washington's last farming frontiers.

up the enterprise with a pointed maxim. "They're biting off more than they can chew."

Last fall, as the framework of conservation ranching practices began shaping up, the outlook seemed bright that the P. & O. would score a production bull's-eye.

Pierson and Ovenell are cooperators of the Skagit Soil Conservation District. They are closely following the ranch conservation plan which the Soil Conservation Service worked out with them early in 1947. The plan shows the productive use to which each acre and parcel of land can best be put. The ranchers use it as a blueprint to measure the fat and lean crop expectancy of their soils.

The work of carving out stock range from heavily forested land will take a year or more. Three bulldozer operators are cleaning up after the stump-shooters. The bulldozers do their work in a split-fraction of the time required by record-busting pioneer ox teams. Nearly 300 acres of stump and forest land have already been cleared. Looking ahead, the P. & O. owners expect to clear another 180 acres of brush and stump acreage by year's end.

First Herefords to graze the seeded pastures will be a herd of 100 slated to be moved onto the range this spring. Rate of growth of forage grasses and legumes and the date the clearing job is completed will determine how soon the stock will be expanded to capacity. Four hundred beef cattle by 1950 is the goal.

Soil conservation practices figure largely in the building of the ranch. The handy, practical guide to better farming—"farm conservation plan"—is the same kind that members of other farmer-operated districts in Washington are using to tackle their land problems.

Both Pierson and Ovenell, a former Skagit county commissioner, are long-time advocates of soil conservation. Their farms, near Burlington, used modern tillage techniques before the Skagit District was organized in 1942.

"But," says Ovenell, "there were a great many things we didn't know about the new science of conservation farming. After we joined the district and got better acquainted with soil conservation, we found we had been doing only half the job.

"Now we are getting better crop yields, without damage to the soil, by farming the conservation way. The technicians recommended the practices necessary to get the best use out of our farming investment. Later we were given technical aid to apply these practices effectively."

By glancing at the conservation plan outlined for their cattle ranch, Pierson and Ovenell can tell quickly the next step to take. Each operation stems from the plan.

Eventually, the entire 732-acre ranch will be seeded to pasture mixtures. Some 136 acres of bottomland were seeded to a flax "nurse crop" last spring. Flax, harvested this fall as a "cash crop," will be plowed under and the field will be in perma-

nent grasses and legume pasture. A second 31-acre field has been seeded to serve as an upland permanent pasture.

Some of the range is rocky, with a thin topsoil mantle. Other soils vary from rich to mediocre. Finding the best pasture mixture to fit each type of soil is a problem that Pierson and Ovenell will work out by sample seedings. Plantings of different mixtures of grasses and legumes are seeded side by side to determine the one best suited to each field. The sample seedings are preliminary to putting the acreage under a permanent grass-type agriculture next year.

Pierson and Ovenell plan to divide their ranch into 40-acre fields in order to practice rotation grazing. Under this method, a pasture is given a period to renew its growth, before it is again used as forage. They will use surplus pasture grasses as silage to feed their cattle when forage is scarce in fall and winter.

The prospects of a winter feed shortage don't worry them. If there should be a drought "up river," they'll winter their stock on the lush feed available on their farms north of Burlington.

Pierson and Ovenell cashed in on a 136-acre flax crop seeded during the spring of 1947 as a nurse crop. Flax being cut here was planted with a companion clover and grass mixture for permanent pasture.

MAKE "BIG MUDDY" BEHAVE

BY GEORGE B. GERMAN

NEVER HAVE I had the necessity of saving our soil brought home to me more thoroughly and clearly than on a recent trip from Yankton, S. Dak., down into northwest Missouri.

In Yankton, from our WNAX offices, we can look out the south windows and watch the Missouri waters go rolling by. Winter or summer, it is rather an attractive scene, especially so in the early spring when the ice breaks up, and you see tons and

(Continued on page 244)

NOTE.—The author is the "inquiring farm reporter" with WNAX, Cowles Broadcasting Co., Sioux City, Iowa.

Aerial view of home plant.

DISTRICT PROFILE

GUY A. LEADER

Poultryman

BY JOHN W. BARNARD

THE COUNTRY schools lost a capable young teacher and the poultry industry gained one of its outstanding breeders when illness, back in 1911, forced Guy A. Leader, of near York, Pa., to quit the classroom for outdoor work.

He chose chicken farming. From a beginning of 6 acres, 67 chickens, and less than $200 capital, Leader pyramided to ownership of four farms, totaling 600 acres, and a national reputation as a White Leghorn breeder. He now has about 14,000 breeders and raises more than 18,000 head of young stock a year. Seven hundred thousand chicks are hatched yearly—all of them from eggs laid on the Leader farms.

The home farm, or home plant, as Leader calls it, south of York on the Baltimore Road, is a mecca for summer poultry tourists, not only because of the attractive appearance of the buildings and surroundings, but because of the proprietor's reputation as a master poultryman in the east to vaccinate against fowl pox. He was one of the first to use cod liver oil in rations. He has made many contributions to better poultry nutrition. In egg-laying contests in the east his flocks have placed at or near the top many times. In the 1945–46 contests he had the high pen for all the official standard egg-laying contests.

Leader was one of the first cooperators with the Soil Conservation Service in York County, in the CCC demonstration program in 1935. All the land in his farms is now being operated under plans prepared by SCS technicians working with the York Soil Conservation District. Practices being carried out on the Leader farms are contour strip cropping, crop residue management, cover cropping, sod waterways, pasture improvement, fencing, woodland improvement, conversion of steep land to pasture, and many others.

Few farmers are more enthusiastic about conservation farming. "Crops yields have definitely improved and the good ranges we have developed mean that pullets can be grown more economically," says Leader. The breeders are kept on good clover and bluegrass pasture and the result is lowered production costs and a higher percentage of eggs hatched.

In all, the four farms will have 300 acres of contour strip cropping when that practice is fully established. Leader points out that now "it is not necessary for the tractor operators to change gears

NOTE.—The author is soil conservationist, Soil Conservation Service, Upper Darby, Pa.

when working on the contour strips, as it was under our old system of field lay-out."

Leader's conservation farming has made it possible to produce more grain. "We produce all of our straw and fodder for litter," he said, "which tremendously reduces the cost of this important item. Considerable amounts of hay have been produced under the program, and we are keeping Angus cattle to use the hay and for pasturing some of the steeper slopes that were not suitable for growing cultivated crops."

The business is a real family enterprise. Mrs. Leader has been an active participant in the growing poultry business and yet found time to rear seven children. George, a son, is in charge of sales, incubation, and service. Guy, Jr. is farm superintendent. Paul, another son who was farm superintendent for 11 years, now breeds turkeys on an adjoining farm. He supplies his father and brother with a considerable portion of the eggs for heavy-breed, broiler chicks.

Leader is active as a civic leader. As a member of the Pennsylvania State Senate, he was instrumental in the passage of districts enabling legislation. He is an ardent supporter of the York Soil Conservation District. "I cannot speak too highly of the district and the knowledge and tact of the men of the Soil Conservation Service," he said. "We need much more soil-conservation work in York county, and the farmers have gained real confidence in the work of the district."

DISTINGUISHED OFFICIALS FROM ABROAD.—After 1 year in the United States a group of agricultural officials from India and Pakistan are returning to their homeland as the nucleus of the agricultural boards of those two countries in planning conservation programs The officials were given training awards at the end of their studies with the Soil Conservation Service.

Left to right: Dr. A. T. Sen, M. Sc., Ph. D. (London), A. R. I. C., A. I. A. R. I., Soil Scientist, Ministry of Agriculture for the Government of India, Member of Executive Council and Senate, Decca University, India.

William X Hull, foreign liaison representative, Soil Conservation Service, Washington.

D. J. Gandhy, B. Sc. (Agr.), B. S. (Missouri), M. Sc. (Agr. Eng.), Assistant Agriculture Advisor to the Government of India.

Rao Sahib (Dr.) R. J. Kalamkar, B. Sc., B. Ag. (London), F. A. Sc. (Bungalore), Commissioner "Grow More Food" program for India during the war, Agricultural Advisor to the Government of India.

H. H. Bennett, Chief, Soil Conservation Service.

M. H. Kahn, B. Sc., A. I. F. C. (Hons), Forest Officer for the Pakistan Government

D. C. Kaith, B. Sc. (Edinburg), Forest Officer, Ministry of Agriculture, Government of India.

Dr. Abdul Ghafur Riaz, B. Sc. (Punjab), Ph. D. (Wales), Agronomist, Department of Agriculture, Government of Pakistan, manager of various experiment stations.

Dr. S. P. Raychaudhuri, D. Sc. (Calcutta and London), Ph. D. (London), F. R. I. C., soil scientist, Department of Agriculture, Government of India, during the war was on special duty with the "Grow More Food" program.

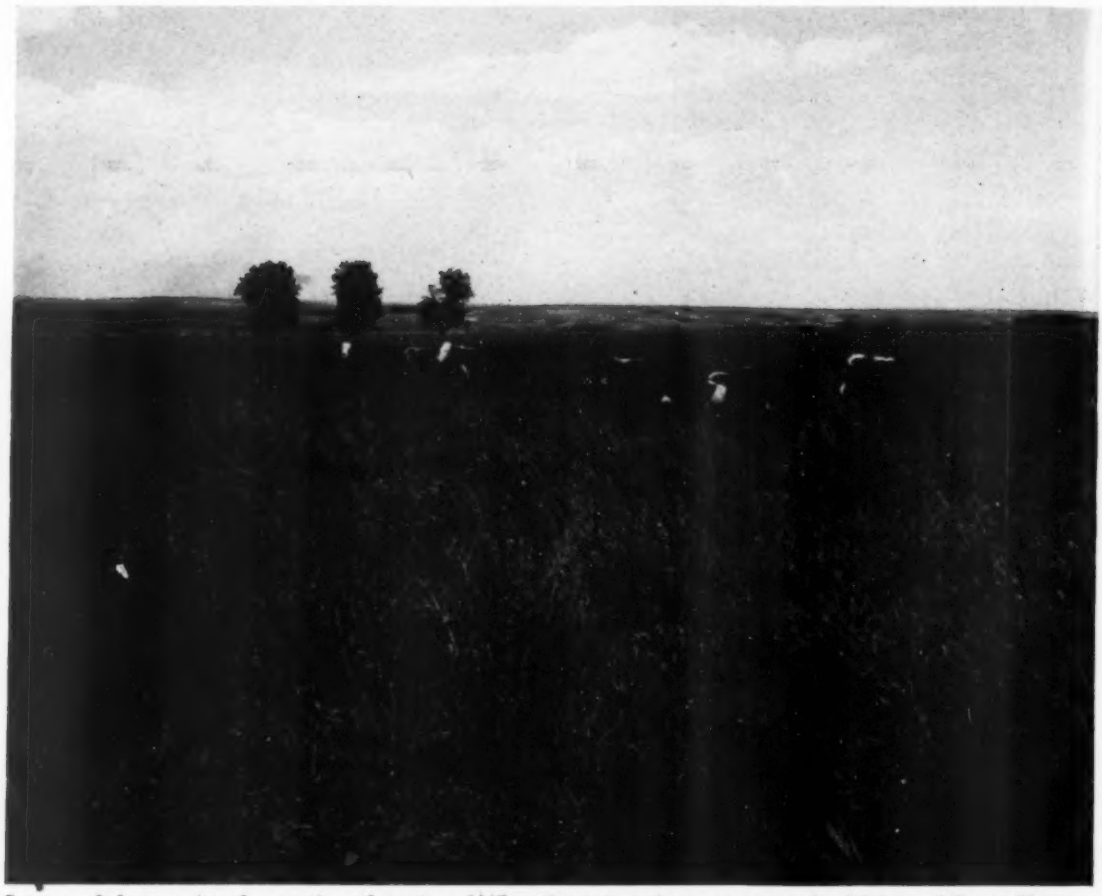
DOZEN FARMERS REPORT GAINS.—Farmers cooperating with the Hagerman-Dexter Soil Conservation District in Chaves County, N. Mex., find that improved irrigation practices increase yields, save water and labor, and conserve the soil.

The leveling of a 6-acre field on the Greer Bros. farm has increased the hegari yield from 15 tons in 1946 to 24 tons in 1947. In 1946, before this field was leveled, three men were needed to do the irrigation job. In 1947, one did it with ease and with a third less water. Greer Bros. leveled 58 acres with a farm-tractor equipment last year at a cost of about $18 per acre.

W. E. Utterback reports that two men needed from 7 to 8 hours to irrigate a 9-acre field on his farm in 1946. Last year, after the field was leveled, one man did the job in 4 hours with the same head of water.

Land leveling cost E. O. Moore, chairman of the district board of supervisors, $39.28 an acre, but he says; "the resulting increased cotton yield more than offset this cost in 1 year." Moore has not kept accurate records of water used before and after his land was leveled, but is sure that he now is getting much better distribution.

Other district cooperators reporting beneficial results from improved irrigation methods are B. L. Barnett, E. A. White, Royce Lankford, J. Michelet, H. Bogle, H. Menefee, M. D. Menoud, J. Langenegger, and V. R. Barnett.



Steers made heavy gains when put in early spring of '45 on this irrigated pasture on ranch of John and Ernest Myers, a mile east of Hoehne in Las Animas, Colo., which was planted early in March 1944. Fifty-one acres on ranch are in irrigated pasture, divided into units for rotated grazing. The mixture includes smooth brome, orchard grass, perennial rye, Reed canary, yellow sweet clover and Ladino clover; nurse crop is oats.

PRIME FEED AT LOW COST

BY WINNETT J. FITE

PASTURE is the cheapest feed that can be grown on the farm for forage-consuming livestock. Figures collected by the United States Department of Agriculture in 16 States show that each 100 pounds of digestible nutrients obtained from pasture cost 64 cents. In contrast, the same data place cost of digestible nutrients per hundred pounds of alfalfa hay at 83 cents, of corn at $1.38 and of oats at $2.02. In Utah, the experiment station found that high-producing, irrigated lands produced 246 pounds of butterfat per acre in pasture, but only 215 pounds of butterfat when in alfalfa. Barley produced 144 pounds of butterfat and oats 98.

An example of the difference in cost between feed produced in an irrigated pasture and feed produced in a grain or hay field appears in the results of a survey made in southern Idaho at the Idaho Experiment Station. Feed costs of producing a

NOTE.—The author is a conservation aide, Soil Conservation Service, Lamar, Colo.

pound of butter averaged 20 cents over the entire year, but only 8 cents while the cows were on pasture.

In addition to being cheaper, pasture is a better balanced food, high in protein, minerals and vitamins. Besides all these advantages, pasture requires no cultivation or havesting. Faced with these striking facts, certainly southwestern farmers—and many others, too—can use more pasture, and better pasture, to make their livestock more profitable.

Good pastures seldom just happen. They must be carefully planned, planted, and managed. Given equal care in planning, preparing the soil, planting, and managing as that accorded cash crops, a pasture will return dividends in extra production. Pasture can be grown on our best land and will provide income comparable, if not higher, than other crops over a period of years, at less cost for labor and equipment, and added improvement in the physical condition and fertility of the soil. Much land not now suitable for other crop production can be made to produce profitably in pasture.

The livestock-carrying capacity can usually be increased on a farm that is adequately irrigated, by establishing a mixed grass-legume pasture. Such a pasture can be fitted into most farm programs by arranging to produce any additional hay and grain needed for the additional livestock at times of year when the pasture cannot be grazed, or by using steers or some other class of livestock that can be marketed at the end of the pasture season.

Aside from factors of climate, soil, and irrigation, the grazing capacity of an irrigated pasture depends upon its plant species and the kind of management it receives.

Ranchmen in range livestock areas are increasingly recognizing the value of irrigated pastures for use during periods when livestock are not on the range. Some of them are finding such pastures profitable as the sole grazing areas for beef cattle. Irrigated pastures used to supplement native ranges make it possible to manage the latter conservatively and thus to increase livestock production. Where an irrigated pasture is available for early spring grazing, spring use of perennial native-grass range can be delayed. This results in greater yield of the native grasses.

A cow will eat her fill in a couple of hours or less on a pasture supporting a vigorous growth of herbage, but on an overgrazed pasture a large amount of energy which should go into milk production is expended in search for grass.

A cow will consume 100 to 150 pounds of green herbage each day if available, but on a closely grazed pasture this is impossible. It is obvious, therefore, that the deficiency must be made up by feeding hay.

On ordinary fertile land, unfertilized, the yield of green herbage at the beginning of the season will be around 400 to 500 pounds to the acre. But if the pastures are rotated 20 to 25 days later, the peak growth will reach 1,200 to 1,500 pounds.

In deciding on an irrigated pasture program, the grazing needs of the livestock and the capabilities of the land are considered jointly, and in relation to the over-all economy of the farm or ranch operation. Grazing needs depend upon the kind and number of livestock to be kept on the farm, as well as the type of livestock management. The land capabilities depend upon soil, slope, degree of erosion, presence of alkali, height of water table, and similar factors. Land capability maps prepared by the Soil Conservation Service are the basis for sound conservation farm planning. Help in such planning is obtained by farmers from soil conservation districts. When grazing needs and land capabilities have been determined, provisions are made in the farm conservation plan for the acreage of pasture required, its location, the rotation of pasture crops with other crops, and any special land-management practices needed to produce pasture crops and conserve soil.

Any land that can be irrigated at a reasonable cost is suitable for irrigated pastures. The worst productive pastures are those in capability classes I to IV. Class I land has no recommended limitation in use, it is suitable for production of all locally adapted crops without special management practices. Classes II and III are suitable for cultivation with special management practices recommended because of erodibility, height of water table, presence of alkali, droughtiness, low fertility, or other conditions. Class IV lands are suited to occasional cultivation only, and are much better adapted for pasture or for hay production than for production of row crops.

On irrigated lands of classes I, II, and III, pasture crops should be rotated regularly with cultivated crops, so that they may improve the soil of the whole farm. On class IV lands cultivated crops should not be grown except in connection

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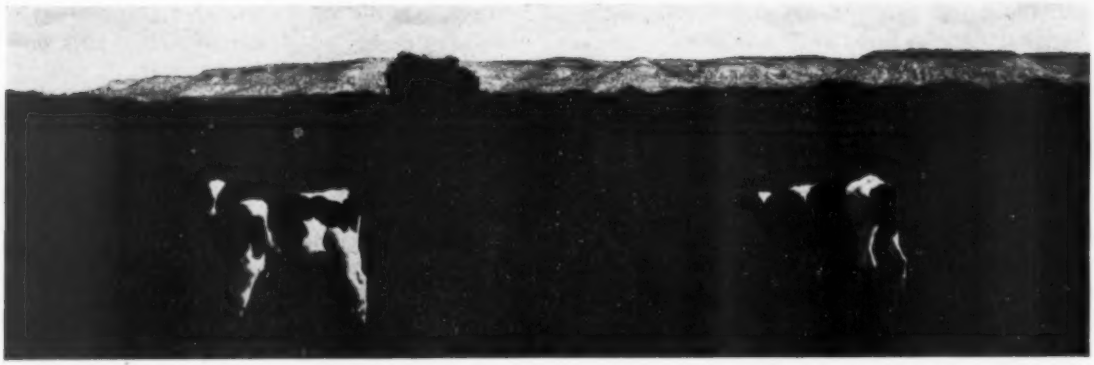

Dairy cows grazing on irrigated pasture of Paul Watts farm in Camp Verde Soil Conservation District, near Cottonwood, Ariz.

with re-establishing pasture crops or hay. On many farms it may be desirable and profitable to use greater acreages of class I, II, and III land than at present for pasture, especially for pasture in rotation with cultivated crops. The better the land, the better the pasture.

Satisfactory pasture crops can be established and maintained on any agricultural soil types.

The dense ground cover of a well-managed stand of pasture plants prevents soil erosion on sloping lands, and the dense root systems improve the structure of the soil and increase its capacity to absorb water. Grass roots, particularly, are effective in improving soil structure because of their volume, density, and fibrous character. They have a binding effect on light soils and a loosening effect on heavy soils, both of which contribute to tilth, permeability, and resistance to erosion. The organic matter contributed to the soil by grass roots decomposes more slowly than that contributed by roots of legumes or by annual green-manure crops. Combination of rapidly decomposing legume roots, which have a high protein content, with slowly decomposing grass roots results in prolonged benefit. Maintaining a balance of grasses and legumes leads to high sustained production of crops grown after the pasture stand is plowed under.

Soil improvement progresses most rapidly during the first few years of a stand of pasture plants. Later, it tends to level off. In general, therefore, the way to take full advantage of the soil-improving capacity of pasture crops is to rotate such crops with others in regular sequence.

Alkali-tolerant pasture grasses and legumes are among the best crops to grow on land that has been drained but requires leaching. Rhodes grass, western wheatgrass, strawberry clover, sweetclover, and some other grass and legume species withstand flooding better than most crops. If planted where they are adapted, these species increase water penetration and thus increase the rate at which alkali salt is removed, in addition to providing useful forage during the period required for leaching.

Two or three grasses plus one or two legumes are usually an adequate number of species for the pasture mixture. Using a greater number of species seldom adds any value to the mixture, and complicates seeding and management.

Grass species differ as to seasons of flush growth, dormancy, and near dormancy. Some grasses grow most rapidly during the cool weather of early spring and others during the warm weather of late spring and summer. Species that grow rapidly in cool weather are desirable for use on areas where irrigation water for pasture use is available only in fall or early spring. Where water is available in spring and summer, grass species having different seasonal growth periods should be selected for use in mixture, so that the pasture, under good management, may produce the most uniform possible yield of high-quality forage throughout the grazing season.

Legumes are valuable in the pasture mixture in that they (1) contribute substantially to volume growth, especially during spring and summer, (2) are richer in protein and certain minerals than the grasses, (3) give variety to the forage and, being highly palatable, contribute to high-volume consumption of forage and thus to high

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CONSERVATION IN THE CLASSROOM

BY ADRIAN C. FOX

ALTHOUGH soil conservation has been taught in some Iowa schools for 10 or 12 years, it was not until 1946 that it became a required subject at all grade levels in the rural elementary schools.

Miss Ivah Green made some interesting observations on the Iowa decision at a round table discussion during the annual meeting of the Soil Conservation Society of America, in Omaha. Miss Green is supervisor of rural education in the Iowa Department of Public Instruction.

"When education in soil and water conservation became a required part of the rural school curriculum," she recalled, "questions on the subject were incorporated into the State examinations. At first inexperienced teachers, untrained in conservation, became panicky because the subject of conservation was entirely foreign to most of them."

The introduction of conservation education into the Iowa rural school curriculum followed study and recommendations by a committee composed of representatives from the Department of Public Instruction, Iowa State College, Agricultural Extension Service, county superintendents of schools, and the Soil Conservation Service.

NOTE.—The author is head, educational relations section, Soil Conservation Service, Lincoln, Nebr.

The State's program is supported by teaching outlines and other aids issued by the Department of Public Instruction. But of equal importance to teachers and pupils, according to Miss Green, is the active support given by chambers of commerce, local chapters of the Izaak Walton League, National Audubon Society, Iowa State Conservation Commission, Agricultural Extension Service, Soil Conservation Service, and others. They have helped by providing such things as prizes for conservation posters, talks, etc.; free trees, shrubs and vines for wildlife habitat plantings; and guidance in the field study of soil erosion and the many conservation practices.

The children have studied farm crops, grasses, weeds, trees, insects, soil textures, wildlife, and other elements of country life. Many have made plantings of grass and trees in school yards or on farms.

In the classroom there have been demonstrations to illustrate wind and water erosion, conservation practices, plant growth; used, also, are salt maps, scrapbooks, conservation posters, etc.

Miss Green, in discussing the growing need for conservation education, stressed the importance of integrating this important subject into the elementary school curriculum at all grade levels.

Round table: Dr. M. D. Weldon, professor of agronomy, College of Agriculture, University of Nebraska; Harry Hagerott, chairman, district board of supervisors, Missouri-Slope Soil Conservation District, Mandan, N. Dak.; Morris Fonda, assistant to the president, Friends of the Land, Columbus, Ohio; Allen R. Lichtenberger, superintendent of Underwood Community School, Omaha; Miss Ivah Green, supervisor of rural education, Department of Public Instruction, Des Moines, Iowa.

She pointed out that since Iowa is an agricultural State, conservation education is essential in urban as well as in rural schools.

"Since many rural children do not attend high school," Miss Green said, "it is doubly important that they become erosion and conservation minded before launching upon their life work of farming. If these children become farmers, they will need education in soil conservation. If they move off the farm, they should be in sympathy with the soil-conservation movement."

The Iowa educator reported an interesting observation made by the parents of pupils who have been studying conservation in school. Parents say their children are showing an increased interest in newspapers, farm magazines, books, and other literature dealing with conservation. Of equal importance is the noticeable increase of parents' interest—no doubt influenced by John's and Mary's enthusiasm brought home from the one-room schoolhouse.

"Sell the 'school marm' on soil conservation and the job will be done," advises A. R. Lichtenberger, superintendent of Omaha's Underwood Community School, in his discussion of conservation education in the secondary schools. "Although the secondary schools are far behind the elementary schools in introducing conservation education into the curriculum, I believe they will eventually give it proper attention."

Lichtenberger agrees with educational administrators and teachers that conservation must be taught in the secondary schools by integration into such subjects as geography, biology, English, art, home economics, history, and so on through all the other subjects where it has appropriate relationship. In addition to teaching conservation by integration, he recommends that educators go a step further by introducing a special course on conservation. He believes such a course should be required of all students before graduating.

"A special high school course on conservation is necessary in order that each student may fully develop a sound and lasting soil conservation concept," he said.

Lichtenberger began teaching soil conservation in the days when school board members warned him to "go easy" as he was invading a new and untried field. He taught his classes the dangers of "murdered soils" and conservation during the dust bowl days when it was necessary to "bootleg" the subject because of the complacency of some educational administrators.

"Fortunately," he said, "that day is past and soil and water conservation may now be taught with the blessing of the school board and educational administrators.

"Teachers should utilize all available resources in teaching conservation, such as State and Federal agences. Such agencies can materially augment classroom teaching by familarizing students with their conservation program."

"The elementary and secondary schools are responsible for the job of thoroughly indoctrinating the prospective college student with the fundamental concepts of soil conservation," said Dr. M. D. Weldon of Lincoln, Nebr., professor of agronomy, University of Nebraska.

Dr. Weldon, speaking on the need for conservation in colleges and universities, said, "It is the job of these institutions to provide practical and technical training necessary in developing the professional conservationist, the vocational agriculture teacher and the practical farmer. It is up to the agricultural colleges to develop curricula necessary to attain these objectives.

Discussing the special conservation curriculum of the Nebraska College of Agriculture, Dr. Weldon said that, in addition to the usual required courses, "students in the conservation group are required to study the conservation of natural agricultural resources, soil management, soil classification and survey, land drainage and irrigation, pasture and range management, livestock feeding, land economics, and public speaking. Elective courses also are offered in rural sociology, farm organization and management, farm machinery, surveying, mathematics, ecology, plant physiology, and other subjects, to fit the special interests and needs of the individuals. The curriculum offers the student an opportunity to develop an understanding of the economic, social, and scientific aspects of farming and of the principles of conservation as applied to farming. It affords only limited opportunity to develop skills in such operations as soil surveying and land-use planning. It is intended to prepare the college graduate to make the maximum use of his subject observations and experience in soil conservation and farm management."

Harry Hagerott, Mandan, N. Dak., the farmer representative on the round table and chairman of the district board of supervisors, Missouri Slope

(Continued on page 239)

Looking BACKWARD—and FORWARD—on the CONSERVATION FRONT

By HUGH BENNETT

MY FIRST UNDERSTANDING and genuine interest in the subject of soil erosion was when W. E. McLendon of Bishopville, S. C., and I were making a soil survey of Louisa County, Va., in 1905. Our chief, head of the old Bureau of Soils, had instructed us to look carefully into the reason behind the reputation of the region for the poverty of its farmland.

This investigation proved stimulating, something outside daily routine. We found considerable naturally poor land—soil formed through the decomposition of talcose schist—but we found also many sloping areas of cultivated or formerly cultivated land which had been made poor by erosion. In woodlands that had never been plowed, there was always deep loamy soil. This was rich in humus and so mellow at all times you could dig into it with bare hands. In many adjacent fields, however, there was stiff clay—subsoil—at the surface . Usually this hardened almost to the condition of rock with every dry spell. Under cultivation, a profound change had come about: With every heavy rain, the mellow topsoil had been stripped from entire fields at a time in a thin layer (or sheet) as water flowed off the fields into the streams muddied with suspended soil.

We realized, when we came to understand this continuing process of soil removal, that we had learned the real meaning of sheet erosion, which today is considered the most widespread and costly form of the erosion process.

NOTE.—The October 1947 issue of Soil Science was devoted entirely to soil conservation and good land use. By kind permission of Dr. Firman E. Bear, editor, we are repeating here a few things said by the Chief of the Soil Conservation Service in his paper, "Development of our National Program of Soil Conservation."

This fundamental discovery started me on a long journey, studying the erosion process and what it had done to the land over the United States and other countries. But it failed to arouse much interest in Washington. I have suspected that it did not fit in with certain theories about soil fertility that were held in some quarters at about that time. At any rate, not much about the subject found its way into the published report on the Louisa survey.

Following this experience in the Virginia Piedmont, my next most revealing find was in Fairfield County, S. C., where a soil survey was made in 1910–11. This survey showed that of the 438,000 acres in the county, 28 percent had been so damaged by erosion that the land had no further practical value for immediate cultivation. In addition, most of the topsoil had been stripped from 16 percent of the land. Since that time, the damaged area has extended even further. Some of the roads we drove over in 1911 with horse and buggy have been completely abandoned because of erosion.

The rural population of Fairfield County at that time was 29,442 (census 1910) ; the corresponding population in 1940 was 13,462 (census 1940). More than half the farm people had quit the farm! That is one of the deadly things uncontrolled soil erosion does: It forces people off the land by impoverishment or ruin of the soil.

I thought, then, that when the report giving those dismal details of land wastage in Fairfield County was published it would arouse considerable interest. To my astonishment, it didn't even ripple the placid surface of our national complacency with respect to the welfare of the land. People just were not interested at that time.

Later, I came to understand something of the difficulties of developing national interest in the welfare of the land. Findings more or less like those in Fairfield County were reported from other parts of the country—from Stewart County, Ga., and Lauderdale County, Miss. But nothing happened. There was neither interest nor comment, just pure indifference—inheritance from those days when our forefathers felt we could never use up our supposedly limitless supply of "indestructible" land! Some well-meaning soil students of the time became so interested in complex fertility studies that they overlooked the terrific rate at which good farmland was being wasted by erosion—never tied it into its relation to the productivity of our agricultural land and our national economy. Some soil specialists thought the land was completely safe, and said, in 1909: "The soil is the one indestructible, immutable asset that the Nation possesses. It is the one resource that cannot be exhausted; that cannot be used up."

When I read that unqualified assertion, I learned that it is possible to put much misinformation into two short sentences. The unfortunate truth is: Soil is subject to such waste and violent changes by erosion, under hard usage, that, as a nation, we can get along only if from now on we take scrupulously good care of our every remaining acre. Too many farms and too many localities already have come to agricultural grief to permit any further fruitless and costly theorizing, offering of panaceas and short-cuts for soil conservation, and assertions without supporting evidence that "we can get the job done better."

In addition to information on the effects of erosion given in some of the older soil survey reports, the Bureau of Soils published three interesting papers that dealt mainly with the effect of erosion—two with water erosion, the third with wind erosion. Shaler in 1890, had pointed to the seriousness of the problem and offered some general suggestions as to what needed to be done. In 1908 Chamberlin also gave some pertinent suggestions on soil conservation, especially in his recommendation that farmers should strive to trap as much of the rainfall as possible in the body of the soil.

* * * the highest crop values will usually be secured when the soil is made to absorb as much of the rainfall and snowfall as practicable. In securing this maximum absorption * * * the run-off, and * * * the surface wash, will be reduced to a minimum. It has already been seen that the wash of even this inevitable minimum is likely to be still too great to keep the proper slow pace with soil-generation, when the surface has much slope * * * The practical problem then lies almost wholly in retaining and passing into the soil the maximum of precipitation. Obviously, this gives the minimum of wash to foul the streams, to spread over the bottom lands, to choke the reservoirs, to waste the waterpower, and to bar up the navigable rivers. The solution of the problem for the tiller of the soil essentially solves the whole train of problems running from farm to river and from crop-production to navigation. . . .

Until about 20 years ago the word "topsoil" was seldom heard. And only a few—soil specialists, road builders, and excavators of earth—ever made any very meaningful use of the word "subsoil." Expressions like normal erosion and accelerated erosion had not found their way into our dictionaries and agricultural treatises.

Even now, too little attention is devoted to the part good productive land plays in the provision of a healthful, nutritious diet. When the topsoil is allowed to wash off the land, that action completely and wastefully disposes of the whole surface soil layer and all it contains—all that nature and man put into it, including elements of nutrition, both major and minor, and the microscopic organsims that help make land productive by assisting with the conversion of unavailable soil constituents into available plant nutrients. We need to know a great deal more about the relation of eroded land to nutrition. We should understand that what is commonly left for the farmer to till is unprocessed, stubborn subsoil, which usually is less absorbent of rainfall than was the topsoil, is more difficult to plow, and is much more deficient in all available plant nutrients.

Subsoil can be improved, of course, but lost topsoil, which is the most productive part of natural soil, cannot be restored within measurable time. And it cannot be brought back from the floor of the ocean. It cannot be mined from the depths of the earth or made by pulverizing rocks. It cannot be grown; it cannot be bought from foreign countries for stockpiling.

Subsoil can be improved with good cultural treatment, including especially the growing of grasses and legumes and the addition of organic manures and mineral nutrients. But even with such beneficial treatment, some particularly unfavorable subsoils do not produce favorably. Generally, subsoil is less productive than the corresponding topsoil, regardless of treatment. For example, the subsoil of Cecil sandy clay loam in south-central North Carolina produced without fertilization, 290 pounds of seed cotton per acre, compared with 950 pounds under the same treat-

ment by the corresponding topsoil immediately alongside (3-year average). With the same fertilization (green manure and 400 pounds per acre each year of a 4–8–4 fertilizer), the corresponding topsoil and subsoil produced the same years an average of 1,123 and 759 pounds of seed cotton, respectively. Here the ratio of productivity as between untreated subsoil and topsoil was 1:3.2; with fertilization the productivity ratio was reduced to 1:15.

Corresponding topsoil and subsoil of a quite different soil type—Muskingum silt loam, in eastern Ohio—produced without fertilization 33.5 and 0.8 bushels of corn per acre, respectively, as an average for 4 years. Here the productivity ratio—for corn—as between subsoil and topsoil was 1:42.

In both soil types the varieties grown on the corresponding plots were the same and the cultural treatments were identical. Also, the corersponding subsoil and topsoil were essentially identical (as shown by total analysis) in chemical composition except that in both soil types the subsoil contained less organic matter and nitrogen.

It appears that the difference in productivity in both of these soil types is due chiefly to the much lower state of availability of plant nutrients in the subsoils . For this reason and others, soil erosion may be the principal cause of malnutrition—and famine. . . .

Throughout the country, the technicians and research specialists of the Soil Conservation Service have been striving to develop as rapidly as possible new field methods and new machines adaptable for use in the control of erosion and in caring for the production needs of each varying locality. Steadily, all this work is taking the form of a new agriculture in our country, an agriculture based primarily on soil conservation farming methods. . . .

Looking ahead to the time when all of the Nation's farmlands have been treated with sound, basic soil conservation measures—which I think could and should be done in a much shorter period than 100 years—we shall see that striking changes have taken place across the country. Probably among the most outstanding of these will be those tell-tale landscape characteristics which show that our highly variable land has been treated, acre by acre, with efficient measures of protection that can be applied only through the hands of those who know and love the land and understand its needs, capabilities, and importance to the individual and the Nation.

All types of land will be in productive use of some kind. There will be no such areas as we now commonly see in useless hideous gullies, burned-over skeletons of forests, and wildernesses of bramble and scrub. Valuable forests and protective growths of grass, vines, and other useful plants will cover those areas that have been made useless for further cultivation through unwise cropping.

Adjustments in land use will have been carried to the point where the more hazardous kinds of farming operations will be appropriately fitted to soil, slope, and climate. Cultivated crops will be on the flatter lands where the soil is deeper and more productive; the steeper lands of shallower, more erodible soil will be covered with trees, grass, or other protective growths.

Man on the land will have been adjusted to his environment better than ever before. His reward will be easier farming, safer farming, large yields, increased income, and increased happiness. People will be more neighborly and will have a better prospective on our individual and collective obligation of stewardship toward the land.

CONSERVATION IN THE CLASSROOM

(Continued from page 236)

Soil Conservation District, introduced himself as a "practical dirt farmer bringing from the 'grass roots' to the professional educator a crying need for conservation education in the public schools."

Hagerott said that he has observed the ineffectiveness of some devices designed to create adult interest in the need for soil conservation.

"A farmer must be first of all a soil conservationist," he said, "and, in addition, he must have a practical knowledge of agronomy, forestry, hydrology, and all the other 'know-hows' that go to make a successful farmer-soil conservationist.

"The mere existence of State and Federal conservation agencies will not alone put conservation on the land. Conservation education must start early in a child's education, as religion does, and be continued. It is a mistake to educate from the old folks down; we should educate from the young people up! Soil conservation must start in the heart and mind. If it starts there, it won't be long until it is on the land. The early advice of Horace

Greeley to 'Go west, young man, go west!' should long since have been replaced by the motto, 'Conserve the soil, young man, conserve the soil!"

Morris Fonda, round-table chairman and assistant to the president, Friends of the Land, summarized the round-table discussion by stressing the importance and current need for an in-service and preservice teacher program that would equip teachers to do an effective job of teaching conservation education in both elementary and secondary schools.

He reported that summer workshops conducted on an individual county basis, under the supervision of local county superintendents, with college credit granted by a nearby educational institution, has been very effective in Illinois. Other States have successfully employed the workshop method of in-service training during which 1 to 6 weeks of study are devoted exclusively to conservation of natural resources, including soil and water.

The training of teachers by the summer workshop method is a slow process. Fonda believes that the teacher-training institutions must bring their curricula up to date, so that teachers will receive training in conservation before they start to teach in the public schools. Thereafter, summer workshops will be sufficient to keep teachers up to date on latest developments in soil conservation and its teaching.

PRIME FEED AT LOW COST

(Continued from page 234)

animal gains, and (4) if inoculated, take part with soil bacteria in fixation of nitrogen from the air, reduce the need for applying nitrogen to the pasture as fertilizer, and increase the amount of nitrogen available in the soil to crops used in rotation with the pasture mixture. Legumes should make up at least 30 percent and not more than 50 percent of the number of plants in the pasture stand. If constituting more than 50 percent, they may create serious danger of bloat.

Each plant species to be used in establishing an irrigated pasture should be selected for its adaptation to the climatic and site conditions, its grazing qualities, and its seasonal rate of production.

In general, grasses and legumes are adapted to wide ranges of soil and other site conditions. Deep-rooted legumes are not adapted to shallow soil, or to soil having a high water table. Both grasses and legumes vary in their adaptation to wet, poorly drained soils and to alkaline soils, and only species of known tolerance should be included in mixtures seeded on such soils. Mixtures to be used on very sandy soils should include deep-rooted legumes and sod-forming grasses.

A well-managed pasture affords an ideal use for sloping areas of erodible soil that cannot be leveled to nonerodible grades. As irrigated pastures, such areas become permanently productive. Livestock production is a suitable use, also, for the best of irrigated farm land. Good pasture is profitable wherever livestock is kept. It is a crop that improves the land while it is producing. It can be handled with a minimum of cost, and it walks off the land when harvested.

Doyle S. Lund, district conservationist, Richfield, Utah, takes a close look at a mixture of forage plants in Floyd Taylor's irrigated pasture in the Fremont River Soil Conservation District. Seeding was done in 1944 to a mixture of adapted grasses and clover. At this elevation—6,200 feet—smooth brome grass and timothy produce good forage yields and help hold the soil in place.

NEW GRASS FILLS GAP IN NORTHERN GREAT PLAINS

BY A. D. STOESZ AND HUGH K. RICHWINE

A WHEATGRASS that came from the north shores of the Black Sea in Russia—at about the same latitude as the State of Nebraska—has already indicated that it may be the answer to the hunt for a satisfactory cool-season grass for western Kansas. It also does well in western Nebraska. And in South Dakota, where it was first given major attention, there is the chance that it may satisfactorily fill the gap between the ranges of crested wheatgrass and bromegrass. It may even replace both species in certain areas.

This grass is intermediate wheatgrass (*Agropyron intermedium*). In appearance, it is generally like the other wheatgrasses. In some ways it is like the native western wheatgrass, and in other ways it is like the introduced crested wheatgrass that came from farther north in Russia. But many of its characteristics are intermediate between the two. Hence, its name.

When intermediate wheatgrass was first introduced into this country in the twenties, its aggressiveness caused plant technicians to fear that it might become a pest. Agricultural workers shied away from it because of its superficial resemblance to quackgrass. They considered it a cousin of quackgrass, and that gave it a bad reputation. Later studies, however, showed that the grass can easily be eliminated by plowing and that its aggressiveness constitutes a decided asset in conservation work.

It is this aggressiveness, so effective in helping to conserve soil and water, that has sharpened the interest of the Soil Conservation Service.

Intermediate wheatgrass is a long-lived, sod-forming perennial. It is like western wheatgrass in growth habits but, owing to its late maturing, it remains green longer than most grasses. The leafy stems are erect and from 3 to 4 feet tall. The seed heads are slightly nodding, from 6 to 14 inches long, and resemble those of other wheatgrasses. The seeds are large, free from hairs on long awns; they thresh clean and with one cleaning by a fanning mill can be seeded with an ordinary grain drill. Since this grass possesses great variability of plant types, there is an opportunity for natural selection.

Experience has indicated that the seed should be drilled in the fall, at about the time for planting winter wheat. If spring planted, it should be at oat seeding time. In either case, the seed should be put one-half to three-fourths of an inch deep in heavy soils and 1½ inches deep in sandy land. Seeding rates range from 6 to 10 pounds per acre, except where it is planted in 40-inch rows to be cultivated for seed production. Then the rate is 4 pounds per acre.

Seedlings are vigorous, resembling newly emerged winter rye seedlings. They emerge about a week after planting and become established quickly. Furthermore, they are resistant to most seedling diseases, with the result that stands are usually good and even. Like other cool season grasses, intermediate wheatgrass starts growth early in the spring and continues to grow in the fall, despite spring and fall frosts. If moisture is favorable during the summer, growth continues although less actively.

To test the range of adaptability of this grass, Soil Conservation Service nurseries, in cooperation with state agricultural experiment stations, made numerous trial plantings in the Northern Great Plains. It has been found to be completely cold resistant, but does not seem to thrive so well in the northern part of the region as farther south. It endures considerable drought, although seemingly not so much as crested wheatgrass. In Utah, however, it is reported to be equally as resistant to drought as crested. It appears to be more tolerant to summer heat, which accounts for its greater adaptability farther south than other introduced cool-season grasses. Like most grasses, it does best on fertile, loamy soils; and it tolerates about as much alkali as western wheatgrass. Its best use in the Northern Great Plains seems to be in the zone between brome grass in the east and crested wheatgrass in the west, although on

NOTE.—A. D. Stoesz is chief, regional nursery division, Soil Conservation Service, Lincoln 1, Nebr. Hugh K. Richwine is district conservationist, Soil Conservation Service, Dodge City, Kans.

Two-year-old stand at Soil Conservation Nursery, Mandan, N. Dak.

properly selected sites its area of use can be extended.

Seed production of a new grass is important in its adoption for farm and conservation use. A hatful of seed collected at Fort Collins in 1937 by Wayne W. Austin, a nursery employee, was seeded at the Soil Conservation Service nursery at Vermillion, S. Dak., that fall. A few pounds furnished to the South Dakota Agricultural Experiment Station at Brookings is the source of its Ree wheatgrass. The first seed crop in 1939 and for the 2 years following was used for further seed increase and for adaptation trials. In 1942, over 1,000 pounds of seed grown in Soil Conservation Service nurseries were distributed to soil conservation district cooperators for seed production to supply local needs. The following amounts were distributed in the five subsequent years: 1,251 pounds,, 1,868 pounds, 7,660 pounds, 4,317 pounds, and 8,950 pounds.

Many farmers in soil-conservation districts are now supplying their own needs for additional seedings and are offering seed for sale. In Kansas, for example, approximately 1,000 acres are devoted to seed production. The demand, however, still exceeds the supply and seed is still selling for from 75 cents to $1 per pound. The South Dakota State Agricultural Experiment Station is certifying intermediate wheatgrass as to species as Ree wheatgrass through its crop improvement association. Thus, from a small lot of seed, the supply is now built up to where farmers are offering it for sale. Before long seed should be available in larger amounts through regular trade channels.

Intermediate wheatgrass has already shown itself good for a variety of uses. Because of its seedling vigor and its ability to produce a quick, effective cover, it is good for waterways and terrace channels. Livestock graze it readily. When it is cut in the early flowering stage, it makes excellent hay. Its early spring and late fall growth lengthen the grazing period and reduce the time of dry feeding. This also saves the native range by delaying grazing in spring until the native grasses are ready.

Two-month-old stand on B. F. Roberts, Jr., farm, 16 miles southeast of Scottsbluff, Nebr.

This is what farmers cooperating with soil-conservation districts in Kansas, Nebraska, South Dakota, and North Dakota say about intermediate wheatgrass:

Clarence Neglie, Larned, Kans., planted 6 acres in 1944 and says: "It comes up quickly, it grows fast, and cows like it. After threshing the seed, I stacked the straw for bedding, but the cattle ate it before I got to use it. This fall it made 8 inches of growth after October 1 and that spot where the water stood for a month is greening up. I planted some more this fall."

Ira Neglie, Larned, Kans., planted intermediate wheatgrass on a sandy strip along his pasture. He says: "It was a dry fall, spring and summer, but the stuff came up, along with volunteer wheat, cheat, and June grass. It nearly blew out once. Even so, it made a good growth and is spreading rapidly."

Jim Greenleaf, Greensburg, Kans., planted the seed on soils ranging from sand to good alfalfa ground and found it doing well on all of them. After he had seeded it in the fall of 1946, an experiment station worker told him that they had tried it and found it wouldn't stand dry weather. Greenleaf says: "His statement caused me to lose interest, but they must have tried something else because it has been about as hot (100° F.), dry, and

cold (19° below) the past year as it ever gets here and it is still doing well. I have been pleasantly surprised at the way it grew and spread last summer and fall, when it was hot and dry enough to thin out the old stand of western wheatgrass."

Henry Jordan, Larned, Kans., offers the opinion that the intermediate wheatgrass he seeded on a heavy soil infested with dogbane will eventually choke the weed out. He also says that his cattle prefer it to wheat pasture, and continues: "When we get too much wheat, I think a lot of hilly land will be planted to intermediate wheatgrass to hold it and build it up until it is needed again. It

Seed plot on Leo Bales farm, 20 miles southwest of Osborne, Kans. It was drilled into sorghum stubble in November and photographed the following May.

really fits in for early grazing until the native grass is ready."

Nathan Hayse, Jr., Mullinville, Kans., states that "it is just the grass we want. It stopped growing in July when it was hot and dry and started again in October when it rained. We pastured it extensively but it still looks good. I'm going to cultivate those 32-inch rows and raise a good seed crop this year. I've just got to raise seed to plant on that rough 80 over west."

Lyman Long, Ford County, Kans., planted intermediate wheatgrass along the sides and bottom of a draw where "it made more growth in 1 year than the bromegrass at the other end has made in 3 years."

Intermediate wheatgrass was planted in 30-inch rows for seed production on the L. T. Miller farm, Kinsley, Kans., in October 1944. It made a good seed crop in 1945, even though it was not cultivated. The yield was a little over 200 pounds of clean seed per acre.

"The year 1946 was dry," says Herman Schoeller, tenant on the Miller farm. "Total moisture for the year was 16½ inches, but we have received only 6.38 inches before August 1. The intermediate wheatgrass on this droughty land (18 inches of soil with sand and gravel underneath) stopped growing early in July and cured up. But after it rained in late August I turned 19 cows and a few calves on a 6-acre patch. The cured growth, plus the new growth, furnished plenty of feed for them for 6 weeks."

In 1947 an attempt was made to thin the stand in order to get a better seed crop, and the seed from that 6-acre field brought more than $1,000.

Elmer Nelson, Broken Bow, Nebr., turned his cattle into an intermediate wheatgrass pasture in April, where they grazed until the middle of May. Then he fenced the livestock out to save what was left for seed production. He says, "The cattle stayed on the intermediate wheatgrass as much as on the other grasses, indicating that they like it as least as well as crested and brome." In his opinion "intermediate wheatgrass is the best cool season grass for the hill lands of Custer County and it is excellent for grassing waterways."

Henry Hanmont, near Broken Bow, Nebr., found that his yearling steers grazed intermediate wheatgrass closer than the native meadow. Even so, by taking them off May 1, he made it possible for the grass to grow to a height of 3 feet by July 15 and expected to harvest 100 pounds of seed per acre.

A. Craichy, Burwell, Nebr., notes that "the neighbors' cows stay on my intermediate wheatgrass whenever they have a chance. It will make a wonderful hay grass due to the dense foliage at the base, as well as good early spring and late fall pasture."

A grass must be good to merit such devotion from farmers who are using it. As time goes on more will be known about it, additional uses will be found for it, and certain limitations may possibly be discovered. In the meantime, farmers are using it profitably and at the same time are producing more seed for extensive use by neighboring farmers and eventually on a Nation-wide basis wherever it is found adapted.

MAKING "BIG MUDDY" BEHAVE

(Continued from page 229)

tons of icepacks moving swiftly down river, some of the smaller pieces resembling lone Indians in fast moving canoes. In summer, from Inspiration Point and Mount Marty Hill, you can look south and west and revel in the fascinating twists in the river, the sandbars, the distant trees, and the brilliant setting sun.

Too often we drink in the beauty of a river such as the Missouri and fail to see the destruction and havoc that goes with it.

When you get down near the other end of the line, and visit with farmers and townsfolk who have been hit by flood, then you begin to realize what a treacherous, lawless, looting robber of our soils and resources it really is.

The Missouri is just a magnified example of the thousands of little rivers, creeks, and gullies in our rich United States. Almost, every farm and ranch in the United States has its own Missouri River chopping and eating away its bank of soil deposits.

And it's only through the harnessing of our gullies, creeks, little rivers, and tributaries of the Big Muddy that we are going to make a lasting impression upon the Missouri itself.

One example of what a lone farm can do was brought out in an interview with Joe Bennett, a good farm operator in Atchison County, Mo.

As Mrs. Bennett put it, "Their farm land reaches from the highest hill to the lowest bog."

From the living room of their house, built on a cut-away bluff overlooking the Missouri and Nishna Bottna River bottoms, she pointed out to me a beautiful level field that once harbored a lake 20 feet deep surrounded by swampy, boggy, bottomland.

Joe Bennett explained how he reclaimed 100 acres of good farming land by filling in this lake-land through draining, ditching, and diking. By ditching and diking, he forced a creek into the bottomland, and with proper drainage finally saw satisfying results as flood waters brought in ton after ton of good, rich topsoil from other farms and left it high and dry for him to farm—land that was definitely headed for the Gulf of Mexico.

"Now," says Joe, "I can dig down from 14 to 20 feet almost anywhere in that field and find nothing but the richest of topsoil. I can crop that land from now 'til the end of time with my present system, and I will always have good, fertile land."

Another example of how the Missouri, its tributaries, creeks, and gullies inflict havoc upon farmers and townspeople in the vicinity of Hamburg, Iowa, and Atchison County, Mo., was brought out by Roy Carpenter, owner and operator of Apple Mountain Farms.

"Hamburg has been inundated with floodwaters from the Missouri and Nishna Bottna Rivers three times in the last 5 years," said Carpenter. "Those two rivers meet right here and when they have a get-together, it's just more than the people can stand."

Carpenter also told how their hill land washed down into the bottoms, and how they went down and bought the bottom land. They bought their own land over again so they could farm it.

Now they are terracing the hill land and protecting the bottom land against flooding waters. "But the big job," says Carpenter, "is work up and down the river. It takes Government aid with large sums of money, along with the individual farmer and community projects."

They are definitely interested in the work being done in the Dakotas. They are at the mercy of the floodwaters. It's a feeling similar to living in the shadow of a waterfall that may gush and spread at any time and wipe out years of work and effort in building a home.

From the southeast tip of South Dakota to the northwest tip of Missouri, or Atchison County, as the crow flies, or the river flows, or the road runs, it's approximately 150 miles, no farther than from Sioux City to the Wheeler Bridge, out by Bonesteel. Only 150 miles of the Missouri River stretch between South Dakota and Missouri, and yet there are over 500 miles in the Dakotas alone, not counting the loops, curves, and bends.

Five hundred miles of river that drains millions of acres of precious land! That 100 acres of soil saved on the Bennett farm in Missouri, a part of it from the Dakotas, is just a cupful alongside what goes down the Missouri past our door each day in the form of muddy, murky, water.

We worry and fret about the prices of grain and livestock and other commodities as they go up or down, but fail to be perturbed in the least about the millions of dollars worth of the stuff it takes to raise and make these commodities, as it

goes floating by our door down the river to the Gulf. Yes, "There's gold in that thar river."

This story, of course, has dealt with saving as much as possible of the rich soil which has swept out of improperly used fields and overgrazed pastures to be temporarily lodged in the river bottoms. In dealing with this phase of the far-flung erosion problem, that extends out over millions of acres between our major stream channels, it is not in any sense meant that soil conservation should confine itself primarily to saving soil after it has departed from the fields and pastures on its long journey to the oceans. The bigger problem, of course, is the control and prevention of erosion in fields and pastures before the soil is dislodged, picked up, and swept away by excessive runoff from uncontrolled rains and melting snow water, and thus started on its seaward journey.

Short contributions such as those on the following pages are invited by Soil Conservation Magazine. A good idea may be helpful to another district, another farmer. Share your experiences!—Editor.

WESTERN GULF

Dr. Riaz. . . . Dr. Shuhart.

FROM TIGERS TO TEXAS.—Dr. A. G. Riaz, agronomist of the Pakistan Soil Conservation Service, and Dr. Donald V. Shuhart of the Fort Worth regional Soil Conservation Service office. The two met in Fort Worth recently for the first time since Shuhart was injured by a tiger on a hunt in Assam Province, India, during the fall of 1945. At that time Dr. Riaz and Dr. Shuhart were working together on a preliminary soil conservation examination of India. Dr. Shuhart has gone on the mission for the State Department. Dr. Riaz came to the United States a year ago for the government of India, but when Pakistan was formed he became a representative of that government.

EXPRESSIVE.—Arthur B. Kennerly, editor of Farm and Ranch Magazine at Dallas, Tex., has come up with a new soil-conservation term. It's "gullyum." He uses it in talking of farmers who don't take care of their land. For example: "He's going to gullyum wherever he farms."

GOOD IN ANY LANGUAGE.—A newspaper published in South Texas prints news of soil-saving activities in two languages. Items submitted by the Agua Poquita and the San Diego-Agua Dulce Soil Conservation Districts appear in Spanish when the farmer-cooperators mentioned are of Mexican extraction.

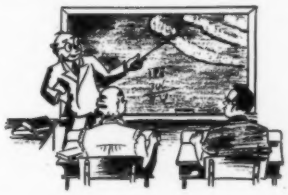
The material is used in English when the farmer or ranchman being discussed can't speak Spanish.

Two paragraphs from *Notas de Kingsville* published Jueves, Enero 29, 1948, say:

"Frank Vaello reports that the sand lovegrass he planted about the 20th of November is up to a good stand. Frank secured the seed from the San Diego-Agua Dulce Soil Conservation District supervisors. From all available information it seems improved and native grasses should be planted in the fall on land that has had a summer soil improving crop on it."

"Francisco Salinas, uno de los cooperadores del 'Agua Poquita Soil Conservation District' tiene toda su tierra preparada al nivel. Tuvo la asistencia de los tecnicos del distrito y tambien le ayudaron a determinar la maera mas facil para bordear. Salinas esta muy contento pro la manera en que se preparo su tierra este ano, y dijo que de ese modo levantara mejores cosechas porque todo el agua sera bien destribuida en su labor."

SOUTHWEST



TEACHING SOIL CONSERVATION.—The teaching of soil conservation has been started in the schools of Phoenix, Ariz., according to Mildred S. Keifer, supervisor of intermediate and upper grades. The subject is being taught in the science studies course in the seventh grades. Packets of suitable publications on the subject have been furnished to the school libraries by the Soil Conservation Service. Some Phoenix schools also are teaching soil conservation in connection with other courses in science, social studies, and agriculture.

The Arizona Education Association recently adopted a resolution urging that more attention be given to soil conservation in all State schools. The resolution urged more rapid application of soil-conservation practices on the land through the democratic methods of soil conservation.

40-ACRE QUICK-CHANGE.—A 40-acre Quay County, N. Mex, farm will be completely remade in a single day next October to demonstrate the application of soil- and water-conservation practices.

This 1-day demonstration, the only one of this sort planned for New Mexico during 1948, will be sponsored by the supervisors of the Canadian River Soil Conservation District. This will be the first "remaking-a-farm" demonstration to be held on irrigated land other than the one at Cottonwood, Ariz., April 27.

Preliminary plans call for the grubbing of mesquite, land leveling, construction of irrigation ditches and borders, plowing, seeding, and irrigating of the land between dawn and dusk.

Newspapers and radio stations of eastern New Mexico and the Texas Panhandle have pledged full support, and farm equipment dealers have indicated that they will donate the use of all machinery necessary.

HE KNOWS BEANS.—Contour farming not only brought increased bean production worth $15 per acre to Guy Jordan, farming north of Lewis, Colo., but also convinced him that this tillage practice is cheaper, speedier, and conserves soil and water.

Jordan kept accurate records on tillage operations, time required for each operation, fuel costs, and yields on three farms which he operates.

Two of the farms are in the Dolores Soil Conservation District. One is a 40-acre tract which Jordan purchased in 1946, and the other is a rented area of 85 acres. Both were farmed without terraces or contour tillage. The third farm of 125 acres, also rented by Jordan, was terraced several years ago and was farmed on the contour last year.

Jordan's records show that the 125-acre terraced and contour-tilled tract produced an average of six 100-pound sacks of beans per acre, while the two straight-row fields yielded only 4½ sacks per acre. Figuring beans at 10 cents a pound, Jordan says that the yield from the contoured field brought him $15 per acre more than the straight-row fields.

Seven tillage operations were carried out on each of the fields prior to harvesting. On the terraced and contoured field Jordan covered 2.62 acres an hour, while using only 1.72 gallons of fuel an hour in carrying out these operations.

The average acreage covered in operations on the two straight-row fields was 2.04 an hour, while fuel consumed averaged 1.87 gallons an hour. In other words, Jordan found that he covered 0.58 acre more each hour on the contoured field, and used 0.15 gallon less fuel.

These figures, Jordan points out, should disprove the idea that contour tillage takes more time or is more expensive. Jordan also observed that the terraces and contour rows held moisture on the ground where it could seep into the soil to aid crop growth, while on the straight-row fields he saw considerable run-off with valuable topsoil being carried away.

IN CELLULOID AND SOUND.—Of interest to soil conservationists is a new 16-mm. motion picture, Exploring the World About Us, produced in color and sound by the extension study division of the University of Utah, Salt Lake City.

This film, which is designed to acquaint elementary teachers with improved methods for teaching science, was directed by Miss Ruth Lippenberger, science training supervisor at the university. Scenes were taken in typical classrooms in the Salt Lake City area. Science teaching in the first, fourth, and fifth grades is shown, with the study of soil conservation in the first and fourth grades being featured. A Soil Conservation Service work-unit conservationist is shown conducting a class on a field tour during which erosion is observed and soil-conservation practices are explained.

BIG SCALE CONSERVATION.—More soil and water conservation practices have been applied on the 30,000-acre Banning-Lewis ranches in El Paso County, Colo., than on any other farm or ranch in the United States.

At least this is the claim of supervisors of the Central Colorado Soil Conservation District.

The range lands which the Lewises operate have a long and romantic history as grazing lands. After the buffalo became practically extinct in this area, riders of the great trail herds used to head for this area because the bluffs formed natural corrals which helped to hold the cattle driven from Texas to Wyoming and Montana.

About one-third of this ranch has been treated with contour furrows and pasture terraces to conserve moisture and increase grass growth. Water-spreading systems, which provide natural irrigation of grass land and prevent concentration of run-off in gullies, have been installed on 2,500 acres. There are 5 miles of gully diversions, 40 stock water dams and wells, 3 soil-saving dikes, 9 spring developments, and 90 miles of fire guards.

Some 400 acres of formerly cultivated land have been reseeded to permanent grasses such as crested wheat and brome. Ten irrigation and flood-control reservoirs have been built. Wildlife has been fostered and developed. Contour farming is practiced on 125 acres and irrigated pastures and irrigation sprinkling systems have been developed.

The most outstanding practice, however, is that of grass management. Proper stocking and use have improved the grass until the 90 miles of fire guards are a real necessity. Not only do Lewis' registered Herefords have a maximum of forage, but erosion has been reduced to a minimum. The Lewises have blended scientific and practical factors into a plan of soil and grass improvement which the Central Colorado District supervisors believe is unsurpassed.

WATER IN RESERVE.—An irrigation storage reservoir constructed by J. N. Ogle on his farm in the Otero Soil Conservation District near High Rolls, N. Mex., has proved its value in savings of water, time, and labor during the first year in operation.

Ogle recalls that he has been confronted with a serious irrigation problem for more than 40 years. The small stream which came from a spring made it necessary for him to spend as much as 24 hours on a single irrigation. Now, with the storage pond completed as a part of his soil-conservation farm plan, he can store enough water to irrigate at regular intervals of short duration. Ogle's pond holds 9 acre-feet of water and has been coated with 12 to 18 inches of clay to prevent seepage, and also has been stocked with fish.

Fifteen similar water-storage reservoirs have been built in the Otero Soil Conservation District under supervision of Soil Conservation Service engineers. With only small heads of irrigation water being available, these storage ponds are proving of great value.

GOOD BUSINESS.—Farmers' Day is to be an annual event with the Kiwanis Club of Prescott, Ariz., as a result of the activities of John D. Freeman, a Kiwanian and district conservationist for the Soil Conservation Service at Prescott. The first Farmers' Day was held on March 11, when each member had a farmer or rancher as his guest. Dave Heywood, a Phoenix businessman, was the principal speaker, his subject being "The Farmer's World Changes."

RANGE RESULTS.—Richard F. Thorley operates a 52,000-acre Hereford cattle ranch in the Iron County Soil Conservation District near Modena, Utah.

Back in 1940, Thorley came to the realization that his 1,500 sheep and 800 Hereford cattle were causing serious damage to his range land and that his enterprise wasn't paying off as it should. He sold the sheep and reduced his

cattle to 600 head. This still didn't bring the desired results, so in 1945 Thorley cut his cattle to 350 head, which was slightly below the estimated carrying capacity of his range.

Thorley has observed great improvement of both the range and livestock during the last 3 years. The calf crop from his breeding herd of cows 2 years and older has increased from 60 percent to 95 percent, and weights have gone from an average of 250 pounds to an average of 425 pounds. Mature cattle have increased in weight and are in much better condition throughout the year.

Thorley operates his ranch on a cow-calf-yearling basis, which, he says, permits greater freedom in making necessary adjustments to meet varying feed supply conditions. Under this plan the yearling steers are sold first; cull cows and bulls second, and finally, the steer calves. Thorley retains a breeding herd of young cows and replacement heifers, and plans to increase his herd to the optimum number as the range improves.

Management practices which Thorley has carried out in connection with his complete soil- and water-conservation program include fencing, water development, reseeding of barren areas, water spreading, better distribution of stock, deferred grazing to permit seed maturing and increased vigor of the grass, lowering of the stocking rate, and protection of denuded areas from grazing.

Thorley says he has observed the following results: Better condition of cattle the year round, more and larger weaned calves, increased production in dollars and cents per cow unit, increased vigor, growth and density of the better grasses and shrubs, and a decrease of water and wind erosion.

NORTHEAST

FARM POND PAYS OFF.—One of the speakers at the Allegany County, N. Y., Potato Show was Walter Brandes, a district cooperator, who reported on his farm pond.

This pond was built by the Allegany County Soil Conservation District in 1946. It was built for multiple use, to provide water for spraying potatoes, for irrigation, for livestock, and for recreation. The total cost was $450. This included the time of the farmer, the materials which he supplied, and the equipment made available by the soil conservation district.

Formerly, Brandes had to travel down a steep hill at least a mile and a half to get the water necessary for spraying his potatoes. This water was pumped into the spraying rig and with considerable difficulty hauled back up to the potato plantings. Time studies now show a saving of 5 hours on each spraying of the 20 acres of potatoes. Brandes reported a total saving of 45 hours for man and equipment during the summer season, time which could be used for harvesting hay and other crops. Figured conservatively, basis at $3 per hour for spraying rig and sprayers, this means a saving of $135 per season.

Figuring the total cost of the pond at $450, the saving in spraying time at $135, and $330 as the possible Government allotment toward construction of the pond, the entire cost of this job has been written off in one season's time. In addition to these benefits, Brandes feels that the pond will be valuable as recreation. Though the pond has not yet been stocked with fish, considerable use already has been made. At the meeting Brandes exhibited snapshots showing full use on a Sunday afternoon, with half a dozen cars parked adjacent to the pond.

People were picnicking along the shore line. There were two boats on the pond, four individuals on inner tubes in the water, several others either in the water or about to get in.

CROPS DROWN NO MORE.—J. Sewell Radcliffe, Cambridge, Dorchester County, Md., states: "On one of our farms, the year before we put in a drainage system, we raised 10 bushels of wheat and 5 barrels of corn to the acre. It was a fairly normal crop year. The year after the drainage system was installed, we raised 18 bushels of wheat and 9 barrels of corn to the acre—nearly a 100 percent increase. We think we can build up our land to where it will produce even high yields."

W. D. Carroll, Ridgely, Caroline County, Md., says: "On one farm I drained a field of 25 acres which I could not grow a crop on at all. After draining, I grew 70 bushels of corn to the acre on this field."

C. Brooks Nagel, Preston, Caroline County, Md.: "In 1945 I raised 65 acres of cucumbers, which I sold for about $12,000. Had it not been for the drainage project carried out by the soil conservation district, I feel I could not have saved more than half of this crop. My conservation program has already meant $10,000 in cash to me."

R. P. Dennis, Berline, Worcester County, Md.: "My yields of corn, wheat, and beans have increased about 20 percent as the result of drainage and other conservation work. Another advantage is that I can plow and plant earlier in the spring and catch higher markets."

Mace LeCompete, Rhodesdale, Dorchester County, Md.: "Because of drainage system put on my farm, I was able to prepare the land and seed a pasture while other farms, not drained, were partly covered with water. My corn yield was considerably better than it would have been without drainage. The drainage project was worth $1,500 to me in one year on my 200-acre farm, although my cash outlay was only $142 for the work."

POTATO YIELDS UP.—Edward L. Kent, of Wellsville, in Allegany County, N. Y., owns a 200-acre hilltop farm near Andover, N. Y. For several years, he grew potatoes there in the conventional square field, up-and-down hill fashion. Then he noticed that he was losing topsoil. So he went to the Allegany Soil Conservation District for help.

He put in 875 feet of tile drain, developed 600 feet of sod waterways, and cleared out boulders with the district's bulldozer. Next, he constructed 8,200 feet of diversion ditches. All of his cultivated land—52 acres—is farmed on the contour.

In 1945, he got 17,000 bushels of high-grade potatoes from his 52 acres—an average of 327 bushels to the acre. Before beginning his conservation program, his potato yields averaged 32 bushels per acre less than they do now.

BENEFITS FROM FARM PLAN.—"My soil conservation plan has meant a great deal to me in the operation of my farm," says J. Albert Sutton, Kent district, Chestertown, Md. "Proper land utilization enabled me to remove from cultivation those parts of my farm which were unsuited for cultivation. Putting those unfit areas into permanent pasture, long term hay, and trees has enabled me to apply better management to the rest of my farm.

"Proper crop rotations, proper tillage, and proper land utilization have enabled me to increase my corn yields 20 to 25 bushels per acre, and my small grain approximately 8 bushels per acre. Through a balanced farm plan I have increased the livestock carrying capacity of my farm by providing adequate grain, hay and pasture for my stock.

"Trees planted in 1941 have made excellent growth and will in a few years give me an economic return from land that previously had no crop value."

NURSERY CUTS PLANT LOSSES.—The Perkins-deWilde nursery near Shiloh, in Cumberland County, N. J., has applied soil-conservation measures on 300 acres of its 500-acre tract. Roeland deWilde, manager, believes that such measures as contour planting and installation of diversion terraces have cut plant losses by 90 percent. Before the conservation program started in 1941 plant losses averaged as much as $5,000 a year.

The Perkins-deWilde nursery is a branch of the Jackson-Perkins Co., which also operates nurseries in Indiana, California, and New York. It is in the South Jersey Soil Conservation District.

DIVERSION TERRACES.—Eugene Mattison, farmer and businessman of Otto, N. Y., in Cattarugus County, spent $56 for a diversion terrace and rescued 8 wet acres. Now, because of this diversion, he has dependable crops of corn and oats. He estimated that his $56 investment netted him $250 in one year.

Another Cattaraugus farmer, Louis Lange, found that three diversion terraces made a lot of difference on his farm. His 56 acres of cropland and 65 acres of pasture had suffered at one time or another from heavy rainfall. Before putting in his diversions, he cared for 16 head of cattle—but he had to buy some hay. His fields were gullied; his corn fields often were too wet. After installing the diversion, he not only raised enough hay for his own cattle, which now number 30, but also sold 45 tons to his neighbors.

$50,000 NET GAIN.—Nineteen farmers in Ontario County, N. Y., cooperators in the Ontario County Soil Conservation District, spent $9,000 to drain 140 acres of muckland. They had to build 4½ miles of outlet ditch. Net gain to the farmers the first year was $50,000. One farmer, Walter Stewart, reported that his drained land had increased in value by at least $100 an acre.

SOUTHEAST

PROFITABLE GULLY.—"One of my most interesting experiences with the Soil Conservation Service occurred in Noxubee County, Miss., in the fall of 1942," reports Joe G. Stevens, soil scientist, Valdosta, Ga. "The planning technician in Noxubee County had asked me to map several farms in a certain community. I got my maps together and soon arrived at my destination. In order to get a check on the property lines, I started looking for one of the property owners. I found him in a field near the road chopping cotton. I stated my business and he pointed out certain property lines.

"As I started to leave, he said, 'Mister, it'll cost you 10 cents to go into that piece of land.' I asked him what the charge was for, and he said, 'Why, we've got the biggest gully in there for miles around. School children come out here every year to look at that gully. We charge 10 cents a head, and we can't make an exception for Government men. We are sure proud of that gully.'

"I asked him then if he didn't think he should try to stop it from washing. 'Stop it from washing! Why man, you must be crazy. Some years we make about as much off of that gully as we do off our crops.'

"So I paid him the 10 cents and charged it up to experience."

UPPER MISSISSIPPI

MICHIGAN SCHOOLS BUSY.—Every work group in Michigan continues to report increased activities by schools lying within the boundaries of soil-conservation districts. These activities consist of:

Tours by teachers and children to farms with soil-conservation plans.

Classroom instruction, including activities such as making clay models of gullied fields and fields with control methods established, as well as large cardboard wall write-ups of conservation activities.

Several county school commissioners have established contests on making wall exhibits with conservation pictures.

In several districts high school teachers and district directors are meeting and planning the most effective way of injecting conservation education into high school curriculums.

County school commissioners are asking for teacher-training activities for the purpose of aiding the teachers more effectively in teaching conservation in their schools.

RURAL SCHOOL COURSES.—The committee working on the Iowa State rural school course of study in science (see "Conservation in the Classroom" in this issue), has developed three additional courses of study outlines as follows: (1) Water conservation; (2) conserving nutrients in the soil; and (3) biological balances. To date this committee working under the direction of Miss Jesse Parker, State superintendent of schools and Miss Ivah Green, rural supervisor, have developed nine units of conservation that are now being taught in connection with rural school science courses. Miss Parker plans to call this committee together in January 1949 to revise the rural school science course to include the units on conservation in the regular course of study. Kenneth King, assistant State conservationist, Soil Conservation Service, participated in the work of the committee.

MINNESOTA MESSAGES.—The East Fillmore, West Fillmore, and Upper Zumbro districts of Minnesota are now printing quarterly letters which they send their cooperators. The boards of these districts think that such letters will help them to keep in closer touch with farmers who have signed agreements with the district. The Upper Zumbro quarterly letter is financed by three banks in Rochester. The East Fillmore District paid for its first letter which was sent out in August. The second one was paid for by the First National Bank in Rushford. Banks of some of the other villages of the districts will pay for future quarterly letters. The West Fillmore District also paid for its first letter. The second one is being paid for by the Spring Valley Commercial Club.

WILDLIFE PLANTINGS.—The Iowa State Conservation Commission has developed a plan for developing wildlife plantings in soil conservation districts. The plan provides that the State conservation commission will furnish funds to match funds raised by the local conservation clubs to carry out projects on farms of cooperators or on public land in the soil conservation district. The approval of the soil conservation district commissioners of all such projects is required by the State conservation commission. A number of district commissioners have met with sportsmen's clubs and have inaugurated plans to carry out a program of wildlife plantings under the program. The Carroll County District, Hardin County District and the West Pottawattamie County District commissioners recently voted to cooperate with the conservation commission in the cooperative plan.

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